



## Endangered species and endangered knowledge

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The recent discovery of a new species of land iguana in the Galapagos (Tzika *et al.* 2008; Gentile *et al.* 2009; Gentile & Snell 2009) is indeed an exciting novelty, of great interest to all zoologists and evolutionary biologists. This species being apparently represented only by a very small population with a very limited range, it was described as a new taxon following an unusual procedure: no fixed specimen(s) (holotype or syntypes) was deposited in a permanent collection, but a live specimen, in which a transponder had been inserted and which then had been released, was designated as holotype. As analysed in detail by Dubois & Nemésio (2007), because of the unclear wording of Art. 16.4.2 of the *Code*, whether such a nomen is nomenclaturally available is open to question, and pending a clarification of the published Rules of the *Code*, will remain so. In this context, some comments on the paper by Gentile & Smell (2009), from a taxonomic and nomenclatural point of view, are in order. I thank Zhi-Qiang Zhang, Chief Editor of *Zootaxa*, for inviting me to contribute to this discussion.

(1) It is clear that, as discussed by Dubois & Nemésio (2007), *for the time being*, the *Code* does not *clearly* prohibit the description of a species without a holotype, as this is a matter of interpretation of its text. We cannot say to zootaxonomists: “please wait for the next edition of the *Code*”. Science has to go on. When a new *Code* is published, zootaxonomists will have to follow it, but today we must do with the current *Code*. As the latter is ambiguous regarding this question, this is a matter of *editorial policy* of journals. From a general point of view, in this case I still favour the Dubois & Nemésio (2007) approach to this problem, even after considering the particular aspects of this case. Actually, these “particular aspects” are similar to some of the cases already discussed by these authors in mammals and birds, and likely to be found again in subsequent cases that will no doubt appear in the near future. I still think that we need a *general* position on such problems, and in particular that taxonomic journals like *Zootaxa* should send a *strong message* to the community by refusing to publish new taxa without fixed onomatophores (name-bearing types) deposited in permanent collections, for the reasons detailed by Dubois & Nemésio (2007).

(2) This lizard, unnoticed by Darwin and others, has survived until now on this island without turning extinct. I fail to see in the three papers dealing with its discovery any evidence that it is more endangered now than one or two centuries ago. If not, the main factor that might change this situation might be the proper publication of its discovery which, in particular, might attract collectors or ill-motivated people. If only conservation criteria had been taken into account, probably the best course to follow would have been to refrain publishing anything about this species until proper conservation measures had been taken. In this respect, although indispensable, neither the mere inclusion of this species in red lists, nor the fact that the population is included in a national park, would be sufficient. Efficient long-term protection of this population would require permanent financial support for an effective guard of these lizards against potential human interventions, as well as against other potential aggressions, including contact with other iguanas that might interact with them through competition or hybridization. As a matter of fact, hybridization with closely related species may be a very powerful way of leading a species to extinction through *genetic pollution* (Dubois &

Morère 1980; Dubois 2007), as well exemplified by the case of the West Indian lizard *Iguana delicatissima* (Breuil 2009 and references therein).

(3) The Galapagos islands have been surveyed by naturalists for more than one and a half century. I wonder whether the authors have checked for the possibility that a specimen of this taxon already exists, although under a wrong nomen, in a collection somewhere. Did they check all collections worldwide for iguana specimens from the Isla Isabela? This would have been a simple and nice solution to the problem, allowing to designate a specimen in a permanent collection as holotype. Even if the specimen was ancient and not perfectly conserved, I think this would have been a better solution than designating a specimen still free in the wild. Unfortunately, Gentile & Snell (2009) did not provide any information in this respect.

(4) If no fixed specimen was available, I maintain that the best procedure would have been to collect and fix a specimen to serve as holotype. No data were provided by the authors to support the idea that collecting a *single* specimen could play any significant role to weaken the population and be a potential factor to lead the species to extinction. Why not take an old male, as suggested by Dubois & Nemésio (2007)? To support the hypothesis that even this could be a significant factor for extinction of the species, one would need at least a mathematical model based on the number of observed specimens of both sexes and various ages in the island and showing that, all other things being equal, the expected survivorship of the population is changed by the removal of a single male. Gentile & Snell (2009) stated that “*the adult population appears unlikely to exceed 200 animals*”, i.e., certainly above 100 or 150, which is not trivial at all. Innumerable cases are known of populations that had been reduced to much lower numbers, or that started from much smaller sizes (e.g., among “invasive species”), and that did not turn extinct.

(5) In the absence of any data or modelling of this kind, it is difficult to avoid thinking that the basic reason for the reluctance to collect a holotype is not based on rational, scientific arguments, but on the recent reluctance, discussed at length by Dubois & Nemésio (2007), of some zoologists to kill specimens, especially when they are “large” and “highly symbolic”. Can one imagine such a similar treatment for a newly discovered species of springtail, earthworm or mite? Even in vertebrates, it would seem unimaginable to ask taxonomists who describe new species of tiny frogs, for example, many of which are just known from a few specimens (e.g., Manamendra-Arachchi & Pethiyagoda 2005), to first estimate the population size and model the effect of removing one or a few specimens before fixing them as vouchers! The difference between iguanas, worms, mites and tiny frogs is easy to understand: the former are large, spectacular animals, that are attractive to men, especially as they somehow resemble the “dinosaurs” that look so important to many. Well, this strongly reminds a “scale of life” point of view, according to which some species are “more important” than others (see in this respect the debate between Donegan 2008 and Nemésio 2009). Evolutionary biologists cannot support such a point of view, but it is doubtless that, in our media-friendly society, it is more likely to see a new species of iguana, of large mammal or of fossil anthropoid, than of springtail, on the covers of leading weekly scientific periodicals or in TV broadcastings—except if it is “the largest”, “the smallest”, “the deepest”, “the oldest”, why not “the pinkest”, as we are now living in a world that takes its standards from sports and show business, in which grades and “records” are of outstanding importance. I do not believe in the scale of life, and, although myself a herpetologist, I do not think that a species of iguana is “more important” than the most trivial species of mite: I think scientists should not treat them differently. So, I do not think that requiring a different taxonomic and nomenclatural procedure for “large animals” is the good message we should send to our colleagues and to the society.

(6) The interpretation above is supported by another statement in Gentile & Snell’s (2009) paper. They consider the possibility, if “*the population is increasing*”, to capture the transponded holotype, but then, not to fix it properly with standard practices of fixation of reptile specimens, but to maintain it in captivity until its natural death, when it is eventually preserved and deposited in a permanent collection. As explained by

Dubois & Nemésio (2007), specimens that die in captivity are usually found dead in strange positions, sometimes partly spoilt, and cannot be fixed as properly, for future studies, as those preserved immediately after euthanasia. Hundreds of lizards are euthanized each year by scientists (not only taxonomists) in controlled conditions, and hopefully this will continue, as this is indispensable if we really want some disciplines of science (taxonomy, anatomy, pathology, physiology, etc.) to progress. As rightly stressed by Nemésio (2009), no scientist in the world, hopefully, kills any specimen (even of earthworm or of mite) with a light heart, but we must know what we want: do we want the progress of knowledge, or do we want to remain lookers-on of the planet and its secrets? In many cases, unfortunately, knowledge cannot progress without an interference of the observer with its object, and in some cases this requires to euthanize living organisms.

(7) As the authors refrained from collecting a specimen, and as the editors of the paper did not require them to do so, I regret that was not followed the course suggested by Dubois & Nemésio (2007: 18–19), namely, applying specifically to the ICZN for a vote on the availability of the new nomen under the provisions of the last sentence of Art. 10.1 of the *Code*.

(8) Contrary to some of the cases discussed by Dubois & Nemésio (2007), the present case was not published “blindly”, i.e., without due consideration given to the Rules of the *Code* regarding nomenclatural availability of nomina. The final decision to publish this paper, as well as commentary papers by several colleagues, was the result of a thorough discussion. So, this paper is likely to become a textbook case regarding the possibility to describe an endangered species without a fixed holotype in a permanent collection. It would therefore be useful to all the community of interested colleagues to be kept updated regarding the evolution of this case. I suggest *Zootaxa* should regularly publish information on the fate of this population, on precise evaluations of its size, sex ratio, age ratio and demography, and if the transponded holotype is indeed captured, photos of it, both alive and after fixation when it is found dead in its cage. It would allow a proper evaluation of the appropriateness of the course that was finally followed in this case.

(9) Taxonomists do not require fixing type specimens for the only sake of having dead animals in jars, just like stamp collections. These specimens are basic objective references for the science that deals with the classification of organisms. As we stressed already (Dubois & Nemésio 2007: 16), there is an incommensurable difference between having a single specimen in a collection and none, much more than between one and one hundred or one million. Without a single specimen, most characters of the species at stake will remain unknown for ever, but the single holotype specimen of the frog species *Barbourula kalimantanensis*, studied through X-ray, was enough to allow Clarke (1987) to describe the whole skeleton of this extraordinary frog. We are now in the century of extinctions (Dubois 2003) and both conservation biologists and taxonomists have their role to play in the conservation of the biodiversity: they should collaborate, not act as competitors or enemies. When conservation biology tries to send the message that taxonomists are responsible for extinctions, this is a misleading message, and this is exactly the message which is carried by the refusal to fix a holotype for a new species. This message weakens taxonomy, which is already a much endangered discipline, and at the worst period, just when we should considerably accelerate the work of inventory of the species of the planet before they get extinct—which will require to fix specimens for the future. Conservation biology should concentrate on real issues concerning the threats on biodiversity, i.e., above all, ecosystem or habitat destructions or modifications: so it will have to be confronted with other social groups, those which have interest in these destructions—and which are much stronger than the small community of taxonomists indeed! Anyway, whatever we do, we may be able to prevent extinction for a few species of large vertebrates and a few other spectacular animals, but *we will not* stop significantly the extinctions that are under way, mostly in the tropics, through major environmental changes. Denying this is not a scientific attitude and is doing a disservice both to taxonomy and to conservation biology. As stated long ago by Spinoza, scientists should neither laugh nor weep or hate, but they should try to understand the world and what is going on. Our community would have much to gain to accept that we will not stop suddenly the

extinctions, that many of them will take place during this century, and act in consequence. If we take the wrong decisions, not only species, but also knowledge, our knowledge on the cornucopia of life, may also turn definitively extinct.

(10) In conclusion, I think biologists of the future will appreciate if not only conservationists but also taxonomists of today have cared for this new iguana species, and have done their best to transmit them the legacy of at least one specimen that would be available for many studies, even if the species unfortunately turned extinct later on.

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